

DATURA ARENICOLA (SOLANACEAE): A NEW SPECIES IN THE NEW SECTION DISCOLA FROM BAJA CALIFORNIA SUR, MEXICO

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ABSTRACT

Datura arenicola, a new species originally collected and named by H. S. Gentry, is documented from Baja California Sur, Mexico. Following a study of *Datura* (Solanaceae) in western Mexico, the new species is placed in the new section **Discola**, with section *Dutra* emended and the revision of section *Ceratocaulis* proposed. *Datura arenicola* is found at elevations of 75–100 m on the eastern Vizcaíno Desert, and is characterized by a short basal stem, decumbent habit, pubescent lobulate leaf, prismatic calyx, violet flower, and pendant globose spiny fruit, dehiscent in four parts. The new species is known from a very limited geographical area, 12 km across the range. A description of the *Datura* on the southern Baja California peninsula and a key to the comparable species are provided.

RESUMEN

Datura arenicola, una nueva especie recogida y nombrada originalmente por H. S. Gentry, es documentada de Baja California Sur, México. Después de un estudio de la *Datura* (Solanaceae) en México occidental, la nueva especie se sitúa en la nueva sección **Discola**, con la sección *Dutra* enmendada y la revisión propuesta de la sección *Ceratocaulis*. *Datura arenicola* se encuentra en las elevaciones de 75–100 metros en el este del desierto de Vizcaíno, y se caracteriza por un tallo básico corto, un hábito recostado, una hoja lobulada pubescente, un cáliz prismático, una flor violeta, y una fruta espinosa globosa pendiente, dehiscente en cuatro porciones. La nueva especie se conoce en un área geográfica muy limitada de 12 kilómetros a través de la gama. Una descripción de la *Datura* en el sur de la península de Baja California y una clave de las especies comparables se proveen.

Key Words: Baja California Sur, Mexico, *Datura arenicola* sp. nov., section **Discola** sec. nov., Solanaceae, taxonomy.

The genus *Datura* L. (Solanaceae) consists of 14 annual and perennial herbs distributed nearly worldwide but originally native to the xeric, temperate, and subtropical environments of the southern United States, Mexico, and Central and South America. All are weedy or showy plants collectively known to produce psychoactive tropane alkaloids and have been employed in medicine and shamanism from prehistoric times (Gayton 1928; Kroeber 1976; Boyd 2003; Felger 2007; Moerman 2009). The succulent, semi-woody species of *Datura* are capable of autonomous selfing and have the basic chromosome number of $n = 12$ (Avery et al. 1959).

During the 1947 Allan Hancock Foundation expedition to Baja California, Mexico, Howard Scott Gentry discovered a new *Datura* species on the Vizcaíno Desert 30 miles south of El Arco. Gentry's specimen #7881, with the unpublished epithet "arenicola," was examined at the California Academy of Sciences (CAS/DS), the Rancho Santa Ana Botanic Garden (RSA/POM), the University of Arizona Herbarium (ARIZ), and University of California herbaria (UC), on loan to Herbario Nacional de México (MEXU). Although it was labeled by Gentry "sp. nov.," this *Datura* has not been treated in any floristic account of the Baja California region

(Martínez 1947; Shreve and Wiggins 1964; Coyle and Roberts 1975; Wiggins 1980; Roberts 1989; León de La Luz et al. 1991; SDNHM 2009). Live plants were examined in November of 1983 at El Vizcaíno Junction, near Gentry's original location. Requiring additional data, Dr. Robert Bye of the Jardín Botánico, Instituto de Biología, Universidad Nacional Autónoma de México (UNAM), directed the January 2010 field project: Diversidad de *Datura* (Solanaceae) en la Reserva de la Biosfera El Vizcaíno. The present work contributes to the morphology and ecology of *Datura arenicola*. The chemical, cladistic, cytologic, DNA, and phenetic analyses may be available in future publications through the Instituto de Biología, UNAM. A native of Baja California Sur, this new taxon in the genus *Datura* (Bye 2001) is affiliated with the newly defined section **Discola**. The new species is known from a very limited geographical range with only two colonies located 12 km apart.

TAXONOMY

Datura arenicola Gentry ex D. R. A. Watson, sp. nov. (Figs. 1, 2B, 3A–D).—TYPE: MEXICO, Baja California Sur, eastern Vizcaíno Desert, 30 miles south of El Arco, 23 Nov 1947, H. S.

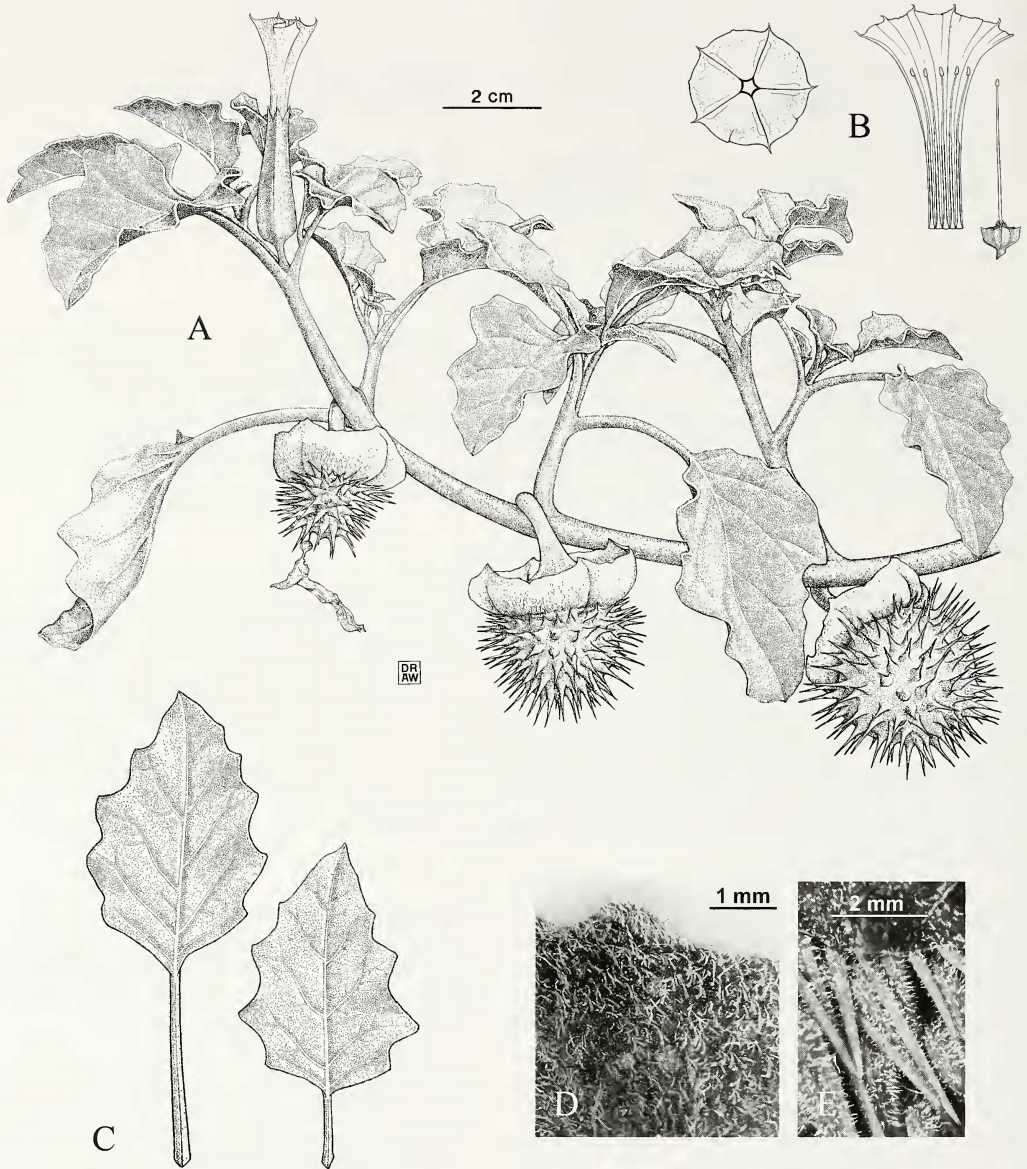


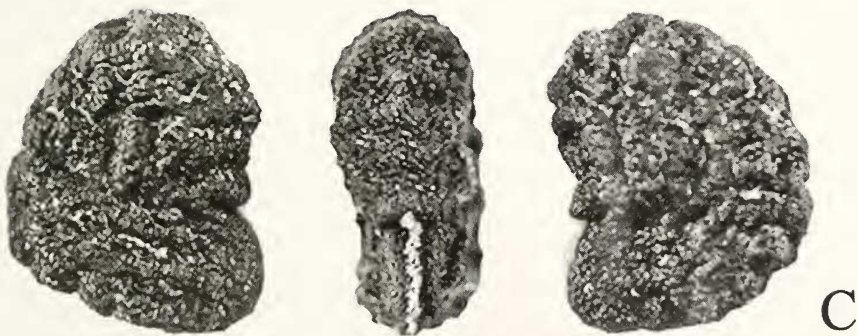
FIG. 1. *Datura arenicola*. A. primary branch. B. Corolla margin, with dissection showing anthers and stamen. C. Typical leaf types (001 Watson F). D. Non-glandular trichomes on desiccated leaf blade, and E. trichomes on spines of immature fruit. Illustration by Robert Watson.

Gentry 7881 (holotype: CAS; isotypes: ARIZ, RSA, SD, UC, UM, US).

Plantae annuae, altis 10–25 cm, diametris 32–140 cm, altitudinibus caulium principalium comparate brevibus, ramis brevibus, erectis, foliis portatis singulariter, petiolis longis, villosis, laminae \pm ovatis, marginibus sinuosis, apicibus obtusis-rotundatis, faciebus abaxialibus canescentibus, faciebus adaxialibus pubescentibus, floribus portatis singulariter, pedicellis erectis sub anthesi, reflexis ubi fructificantibus, calycibus oblongis-tubularibus, 5-costatis, in sectione transversali 5-angulatis, corollis violaceis, infundibulariformibus, limbis

expansis vel ascendentibus, 2.8–4.5 cm longis, 5-lobatis, apicibus loborum subulatis, antheris dilutis luteis, fructibus pendulis, fere globosis, dehiscentibus in 4 partibus, seminibus nigris, compressis, testis laevibus, tumidis circa incisuram hili, marginibus externis subtiliter foveolatis, arillis elongatis.

Annual herbs 10–25 cm tall with decumbent branches spreading up to 1.4 m in diameter. Dichotomously branched, but appearing to divide by four stems from a basal stem 0.5–4.5 cm in height, the stems green speckled purple, glabrous. Leaves bluish-green, cinereous, pubescent above, canescent beneath, blades 4–9 cm long and 3.5–



3 mm

FIG. 2. Seed-character transference is indicated by the testa foveae and inflation around the hilum of **A.** *Datura quercifolia* and **B.** *D. arenicola*, which displays the compressed D-shape with elongate aril common to section *Dutra* and the transversely notched hilum that is characteristic of **C.** *D. discolor*. Photographs by Robert Watson unless credited.

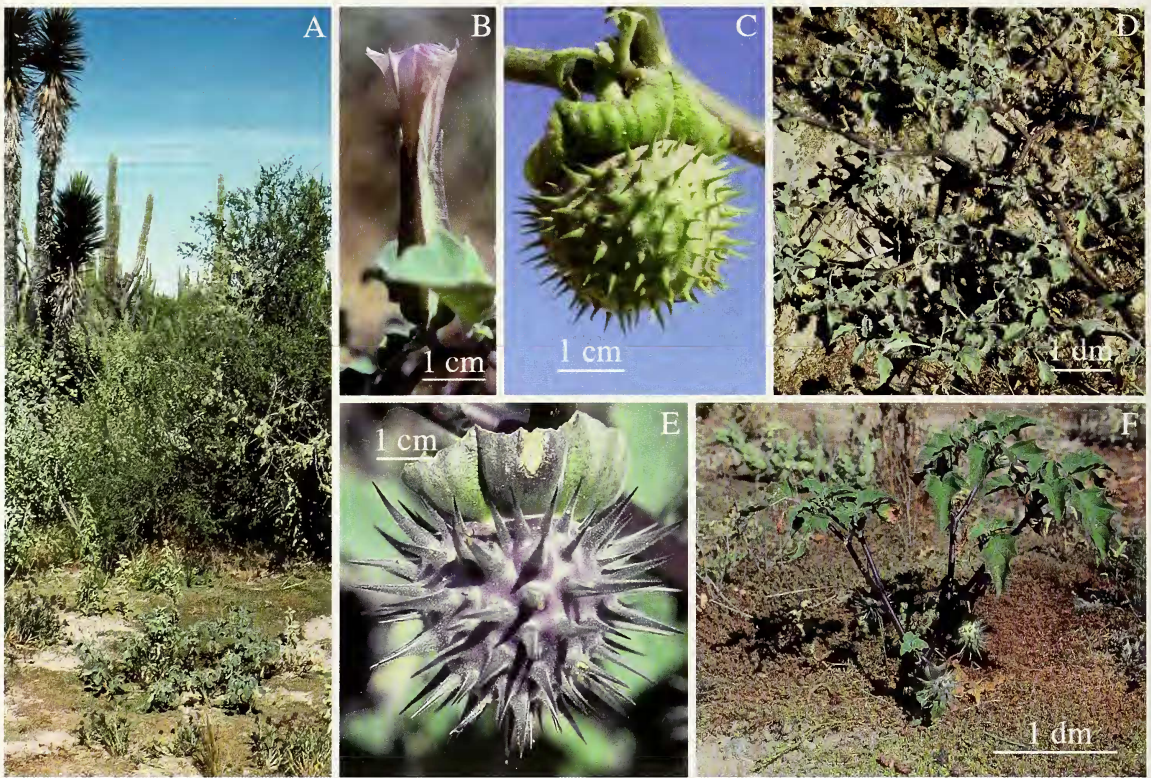


FIG. 3. *Datura arenicola*. A. Habitat. B. Flower in early anthesis. C. Capsule (photograph by Robert Bye). D. Specimen from El Vizcaíno Junction (001 Watson F). *Datura discolor* form B flower as in Figure 6F, E. capsule with spines suggesting *Ilex* aneuploidy, and F. dimorph with sinuate-dentate leaves from El Vizcaíno Junction (002b Watson F).

7.1 cm wide, acutely pointed ovoid, sinuous, with three to five obtusely dentate lobes along the undulating margins; petioles 1.5–6.8 cm long, villous, green with violet stripes, terete with a shallow groove on the upper side. Flowers tubular to funnel shaped, solitary, axillary, erect on 4–6 mm long pedicels; corollas deep purple to pale reddish violet becoming white toward the base, the tube 2.3–4.5 cm long, the flared lobes spreading 0.5–2.5 cm in diameter at the rim, crowned with five caudate lobes 1.7–2.6 mm long; stamens filiform, adnate one third the corolla tube length, anthers pale yellow 2.2–2.4 mm long and 1–1.3 mm wide; styles included, 2.1–2.9 cm long; calyces 1.6–3.6 cm long, one half to two thirds the length of the corollas, green with a purple tinge, oblong tubular, with five prismatic ribs, terminating in five acumina 2.5–7.8 mm long and 1.5–3 mm wide at their base, circumscissile, leaving a persistent rotate collar forming a membranous cap 2.2–4.1 cm in diameter above the mature fruits. Capsules globose, pale green, 2–3.4 cm long, 2.3–3.6 cm in diameter (excluding spines), dehiscent regularly by four valves, puberulent to pubescent, nodding on a recurved pedicel 1.8–2 cm in length; pericarp spinose, spines 0.4–1 cm long, sub-equal in length; ovary 2-locular. Seeds black,

compressed reniform, 3–3.4 mm long, 2.5–3.3 mm wide, 1 mm thick, the lateral surfaces of the testa smooth with minute foveae along the dorsal margins, inflated on both sides at the transverse notch of the hilum, aril elongated.

ASSOCIATIONS

The central Baja Californian province includes species from both tropical and temperate climates and is floristically distinguished by plants of southern Mediterranean-Tropical distribution (Peinado et al. 2009). According to Wiggins (1969), "Greater variety among the plant species is the rule along the eastern margin of the Vizcaíno Desert." He listed common plants in this area as: *Yucca valida* Brandege, *Lycium californicum* (Nutt.) ex A. Gray, *L. berlandieri* Dunal, *Larrea tridentata* (Sessé & Moc. ex DC.) Coville, *Encelia farinosa* A. Gray ex Torr., *Cylindropuntia cholla* (F. A. C. Weber) F. M. Knuth, *C. calmalliana* (J. M. Coult.) F. M. Knuth, *Lophocereus schottii* (Englem.) Britton & Rose, *Stenocereus gummosus* (Englem.) A. C. Gibson & K. E. Horak, *Atriplex barclayana* (Benth.) D. Dietr., *A. canescens* (Pursh) Nutt., *Bahiopsis deltoidea* (A. Gray) E. E. Schill. & Panero, *Eriogonum scalare* S. Watson,

Euphorbia xanti Englem. ex Boiss., *Stillingia linearifolia* S. Watson, and *Pachycereus pringlei* (S. Watson) Britton & Rose. The common associates of *D. arenicola* are *Cenchrus palmeri* Vasey (desert sand burr) and *Datura discolor* Bernh. (desert thorn apple). The major herbivores include *Trichobaris compacta* (Curculionidae), *Lema daturaphila* (Coleoptera) and the "large moth larvae" listed on Gentry's label that was perhaps a species of *Manduca* (Sphingidae), the hawkmoths known to pollinate *Datura*.

Growing in sandy alluvium on the Pacific slope, *Datura arenicola* is a rare endemic native only to the Vizcaino Region of the Sonoran Desert. The local campesinos call it *chamica*, as distinct from *tolguacha*, which in this area refers to the larger flowering *D. discolor*, also known as *toloache* elsewhere in Mexico. In allusion to *D. discolor*, Wiggins (1980) and Roberts (1989) mistakenly extend the range of *D. inoxia* Mill. throughout Baja California, the result of treatment by Barclay (1959) and Fosberg (1959) for the Sessé & Mociño plant previously known as *D. meteloides* DC. ex Dunal. This confusion was resolved on examination of BCMEX specimens which confirm that species to be *D. wrightii* Regel, a native of the coastal cismontane north of the 30th parallel, but also wrongly cited throughout the peninsula by Ewan (1944) and Wiggins (1980). Excluding *D. wrightii* cultigens, only *D. discolor* is found crossing the peninsula from 125 km north of the type locality, eastward in the watershed of the Sierra San Francisco and Sierra Guadalupe, to the south on the Pacific seaboard, along the Gulf coast and throughout the southern Cape region (Fig. 4). A description of this highly adaptable and widespread regional species is essential for taxonomic accuracy and in order to better understand relationships among the *Datura* on the Baja California peninsula.

Datura discolor Bernh. Über die Arten der Gattung *Datura*. Neues Journal der Pharmacie 26(1):149; 1833. Linnaea VIII. Litt. Ber.:138. (Figs. 5, 2C, 3E-F, 6A-I).—TYPE: DUTCH WEST INDIES [Netherlands Antilles], Curaçao (holotype; *Stramonia corassavica humilior*. Hermann, P. 1698. Paradisus Batavus. 1:233-234; lectotype: icon [Fig. 5]). In synonymy; *Datura thomasii* Torr. 1857 [1858]. Pacific Railroad Report. 5(2):362-363; 1857. United States and Mexican Boundary Survey 2(1):155. Commonly found on sandy flats, arroyos, margins of cienegas, playas, and roads throughout the Sonoran Desert and lower Baja California, sporadic on the Central Mesa, but largely native to tropical maritime Mexico and the West Indies.

Annual herbs, erect, 10-80 cm in height. Dichotomously branched, basal stem and branches green, or tinted violet to dark purple, glabrous with indumenta of simple and glandular hairs. Leaves green, glabrate to puberulent, sometimes cinereous,

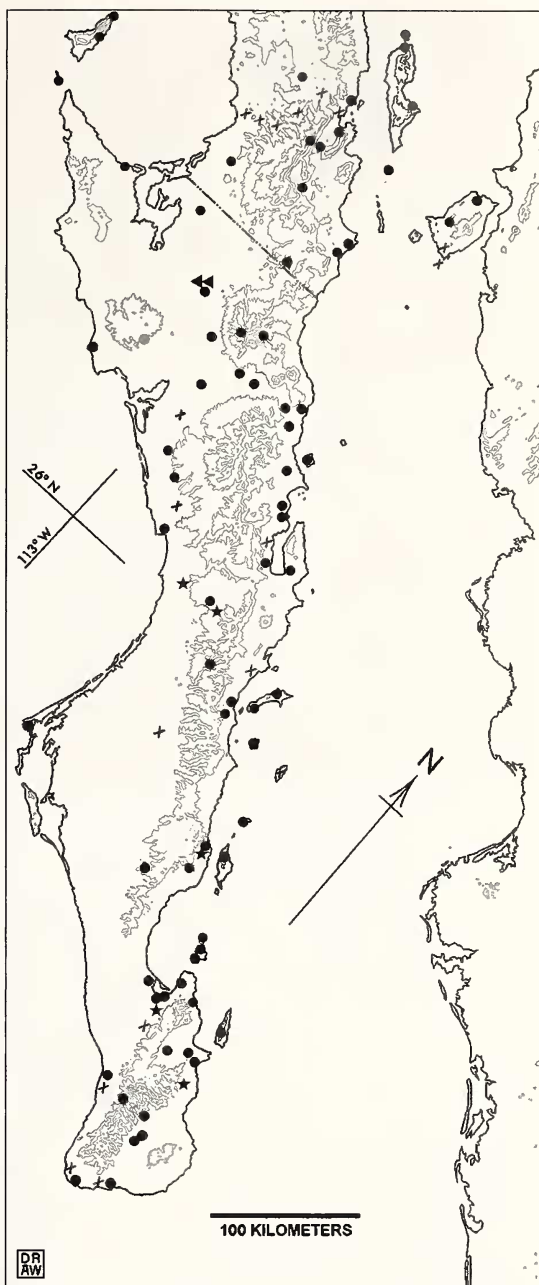


FIG. 4. Distribution of *Datura* species in Baja California Sur, Mexico; \blacktriangle *D. arenicola*, \bullet *D. discolor* specimen vouchers, \times *D. discolor* field locations, and \star *D. wrightii*. Map by Robert Watson, adapted from Landsat, contour elevations at 500 m. Biodiversity occurrence data published by: Instituto de Biología, Universidad Nacional Autónoma de México (Accessed through GBIF Data Portal, data.gbif.org, 2013-08-12).

blades 3-15 cm long and 3-13 cm wide, acutely pointed ovoid to deltoid, entire to angular-sinuate but commonly bearing three to five acutely dentate lobes along each margin; petioles 1.5-8.8 cm long, green to purple, terate with a shallow groove on the



FIG. 5. *Datura discolor* lectotype engraving of *Stramonium corassavica humilior*. Hermann, P. *Paradisus Batavus*. 1698:233-4 (seeds actual size). Courtesy of the Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh, PA.



FIG. 6. *Datura discolor*. A. Capsule, San Ignacio (003d Watson F). B. Corolla apex and C. side view of a Cabo San Lucas phenotype (007 Watson F). D. Heat reflectance defined by Kodak infrared film. E. The violet floral variant, Cedros Island (photograph by Jon Rebman). F. Form A flower, G. capsule, and H. dimorph with entire leaves from El Vizcaino Junction (002a Watson F). I. Xerophyte flower at full anthesis, La Paz (004 Watson F).

upper side. Flowers tubular to trumpet shaped, solitary, axillary, erect on 4–6 mm long pedicels; corolla exterior greenish-yellow to yellowish, white, or violet becoming white toward the base, with five or more violet striae inside the throat, usually appearing as a ring, hence, the Latin epithet meaning “two colors,” the tube 6–18 cm long with the flared limb spreading 1.2–8 cm in diameter, crowned with five subulate lobes 1.7–9.5 mm long, separated by angular interlobules giving the appearance of 10 acumina; stamens filiform, 6–14 cm long, adnate one third the corolla tube length, styles 6.4–10.4 cm long, anthers off-white, 3.7–9 mm long, and 1.5–2.8 mm wide; stigma below the anthers; calyces 3–9 cm long, two fifths to two thirds the length of the corolla, green or purple tinged, oblong tubular, with five prismatic ribs terminating in five acumina 4.5–15 mm long and 3.1–6 mm wide at their base, circumscissile, leaving a persistent rotate collar forming a membranous cup-shaped brim 1.5–5.8 cm in diameter above the mature fruit. Capsules ovoid, pale green to purple, 2.6–4.5 cm long, 1.5–3.8 cm in diameter (excluding spines), dehiscent regularly by four valves, sparsely puberulent to pubescent, nodding on a recurved pedicel 1.8–2 cm in length; pericarp spinose, spines 0.8–3.2 cm long, sub-equal

in length, a few occasionally missing; ovary two-locular. Seeds black, compressed reniform 3.1–4.2 mm long, 2.4–3.5 mm wide, 1.2–1.7 mm thick, lateral surfaces of the testa verrucose and rugulose, hilum transversely notched, aril elongated.

The phyletic plasticity observed in *D. discolor* requires further research. During the January 2010 central Gulf coast survey, individuals of *D. discolor* were observed with white or occasionally deep violet corollas (Fig. 6E). Thus *D. discolor* displays floral variants analogous to *D. stramonium* L., a genome that carries dominant violet (var. *tatula*) and recessive white (var. *stramonium*) alleles (Avery et al. 1959). During the Baja California survey in November of 1983, individuals of *D. discolor* were observed in warmer temperatures with yellowish to white corollas only, some of which were tinted violet at the rim but otherwise were identical to the whiter phenotypes (Fig. 6B, C). Bright sunlight and cool temperatures appear to trigger the violet floral variants, which produce an infrared reflective chromophore (Fig. 6D). Xerophytes occur along Gulf shorelines with 6 cm long, tubular, greenish-yellow corollas (Fig. 6I; 3226 Johnson CAS), whereas the synonym *D. thomasi* (Torrey 1857) specified plants with dwarf corollas from

the extremely arid Colorado Desert (015 *D. R. A. Watson* F). Consistent with the leaf studies made by Ewan (1944), ancestral remnants of this widespread *Datura* may be preserved on the periphery of the range. For example, the West Indian *D. discolor* lectotype (Fig. 5), which Fosberg (1959) considered problematic, resembles in flower and fruit El Vizcaino forms A and B (Fig. 6F, G). Forms A and B differ from peninsular *D. discolor* with over-sized calyces two thirds the length of the delicate corollas, dimorphic leaves either entire or dentate, and variation in fruits (Figs. 3E, 6G) suggesting some of the aneuploid forms described by Blakeslee in *D. stramonium* (Avery et al. 1959). *Datura discolor* is primarily identified by its uniquely wrinkled seed coat, associated with a prismatic calyx, violet striped corolla throat, and pendant spiny oval fruit.

DISCUSSION

All species of *Datura* can be easily differentiated by variations in flower, fruit, and seed morphology. The seed of *D. arenicola* is clearly distinct from all other species in the genus (Fig. 2). However, seed character similarities can be observed in the testa foveae and inflation around the hilum in *D. arenicola* and *D. quercifolia* Kunth (1818). The compressed D-shape with elongate aril is common in seeds of section *Dutra*, but the transversely notched hilum is an attribute of *D. discolor*. The leaves and pendant capsules of *D. discolor* are very similar to *D. arenicola*, but in the latter the leaves are lighter bluish-green, undulate along the obtusely dentate margins, and the smaller globose fruits have relatively shorter spines (Fig. 3C, D). According to Felger (2000) *D. discolor* is one of the largest-flowered plants in the Sonoran Desert, however the flowers of some *D. discolor* xerophytes, as well as *D. quercifolia*, and *D. arenicola* are among the smallest in the genus *Datura*. The diminutive violet flower of *D. arenicola* strongly resembles that of *D. quercifolia*, along with a decumbent habit that is greater in width. Research into the legitimate priority of *D. gigantea* C. Huber (1867), also described as "low in height and very much wider in width," has confirmed the binomial to be a synonym of *D. quercifolia* from western Mexico (Watson 2012). The morphometric data provided in Table 1 display the character ranges and median (in parenthesis) of 24 *D. discolor* and 12 *D. arenicola* plants examined in herbaria and in the field November 1983 and January 2010.

Gentry noted *D. arenicola* grew on the lee side of dunes, but the typical disturbed areas in which the species prefers to grow today are found along graded roads. Such habitat disruptions have been correlated with germination in the genus *Datura*. The "sand dwelling" *Datura* exhibits adaptations

that may limit its dispersal to sandy habitats; *D. arenicola* has a short basal stem, decumbent posture, and more developed tap root system, while *D. discolor* rises on an elongate basal stem with a tap root typical of section *Datura*. Similarities to *D. quercifolia*, a representative of section *Datura*, may be the result of long-distance dispersal from an ancestral stock. The "oak leaf" *Datura* grows naturally in eastern Texas, southern New Mexico and Arizona, from the Colorado River in Baja California through the Sierra Madre Occidental, the Central Mesa, and the Sierra Madre Oriental (Luna-Cavazos and Bye 2011).

Within the genus *Datura*, three classical sections have been historically recognized. The widest-ranging section *Datura* L. (formerly section *Stramonium* [Tourn.] Bernh.), which includes *D. stramonium*, *D. ferox* L., and *D. quercifolia*, is distinguished by prismatic calyces, erect capsules dehiscing regularly by four valves, and black seeds. Section *Ceratocaulis* (Spach.) Bernh. is considered to be monospecific, including only the hydrophilic *D. ceratocaula* Ortega, which is characterized by tubular calyces, smooth pendant fruits dehiscing irregularly, and charcoal brown seeds. Section *Dutra* Bernh. with tubular calyces, pendant capsules dehiscing irregularly, and brown, reddish brown to buff-yellow seeds, has been divided into two sub-sections (Jiao et al. 2002; Luna-Cavazos et al. 2008): the tuberous-rooted perennials, *D. metel* L., *D. inoxia*, *D. velutinoso* V. Fuentes, *D. wrightii*, and *D. lanosa* Barclay ex Bye; and the tap-rooted annuals, *D. kymatocarpa* Barclay and *D. leichhardtii* F. Muell. ex Benth. (subsp. *pruinosa* [Greenm.] A. S. Barclay ex K. Hammer; in synonymy, *D. pruinosa* Greenm.). On occasion, *D. discolor* and *D. reburra* Barclay have been incongruously included in section *Dutra*.

SECTIONAL REVISIONS

The 14 accepted species of the genus *Datura* may be separated into four sections (Table 2) as the result of several recent investigations. Based on the prismatic calyces and pendant capsules dehiscing regularly by four valves, *D. discolor* and *D. reburra* belong to an unnamed section proposed by Jiao et al. (2002), bridging sections *Datura* and *Dutra*. This new section was provisionally characterized by Mace et al. (1999) as section IV, *Discolor*. Cytology, phenetic and allozyme analyses (e.g., Palomino et al. 1988; Jaio et al. 2002; Luna-Cavazos et al. 2000), along with AFPL (Mace et al. 1999) and peroxidase isozyme studies (Conklin and Smith 1971; Fuentes 1983; Xiqués et al. 1986; Luna-Cavazos et al. 2008) establish the quantifiable validation for a new section diagnosis.

It is proposed that specific members of section *Dutra* be divided into two sections: *Datura* L.

TABLE 1. MORPHOMETRIC COMPARISON OF *DATURA DISCOLOR* AND *D. ARENICOLA*.

Character	<i>D. discolor</i> (median)	<i>D. arenicola</i> (median)
Root length	14.0–23.0 cm (18.5 cm)	19.0–35.0 cm (30.0 cm)
Plant height	20.0–80.0 cm (30.0 cm)	10.0–25.0 cm (21.0 cm)
Plant width	17.0–67.0 cm (29.5 cm)	32.0–140.0 cm (60.0 cm)
Caulis height	4.0–45.0 cm (18.0 cm)	0.5–3.5 cm (1.3 cm)
Caulis width	0.7–1.7 cm (1.2 cm)	0.5–1.5 cm (0.9 cm)
Petiole length	1.5–8.8 cm (4.7 cm)	1.5–6.8 cm (5.2 cm)
Petiole width	0.3–0.5 cm (0.3 cm)	0.3–0.4 cm (0.3 cm)
Leaf-5th node length	4.0–14.2 cm (7.1 cm)	4.0–9.0 cm (7.3 cm)
Leaf-5th node width	4.0–13.0 cm (5.3 cm)	3.5–7.1 cm (5.9 cm)
Corolla length	6.0–18.0 cm (10.2 cm)	2.3–4.5 cm (3.6 cm)
Corolla width	2.0–7.8 cm (5.2 cm)	0.5–2.5 cm (1.4 cm)
Corolla acumen length	3.1–9.5 mm (4.0 mm)	1.7–2.6 mm (1.8 mm)
Style length	6.4–10.4 cm (9.3 cm)	2.1–2.9 cm (2.6 cm)
Anther length	3.7–8.6 mm (6.2 mm)	2.2–2.4 mm (2.5 mm)
Anther width	1.5–2.8 mm (1.8 mm)	1.0–1.3 mm (1.1 mm)
Calyx length	3.4–9.0 cm (6.3 cm)	1.6–3.6 cm (2.6 cm)
Calyx width	0.8–1.7 cm (1.6 cm)	0.7–1.0 cm (0.79 cm)
Calyx acumen length	4.5–12.9 mm (8.4 mm)	2.5–7.8 mm (4.1 mm)
Calyx acumen width	3.1–4.0 mm (3.2 mm)	1.5–3.0 mm (2.4 mm)
Calyx rotate collar height	0.7–1.5 cm (1.3 cm)	0.5–1.2 cm (0.7 cm)
Calyx rotate collar width	2.6–5.8 cm (4.3 cm)	2.2–4.1 cm (2.5 cm)
Capsule height	2.6–4.3 cm (2.9 cm)	2.0–3.4 cm (2.2 cm)
Capsule width	2.2–3.8 cm (2.7 cm)	2.3–3.6 cm (2.5 cm)
Spine length longer	12.5–25.2 mm (16.0 mm)	3.9–10.0 mm (5.5 mm)
Spine length shorter	10.3–20.0 mm (11.3 mm)	2.9–7.3 mm (4.9 mm)
Seed length	3.2–3.8 mm (3.5 mm)	3.0–4.0 mm (3.5 mm)
Seed width	2.7–3.4 mm (2.8 mm)	2.5–3.3 mm (3.2 mm)
Seed thickness	1.2–1.7 mm (1.5 mm)	1.0 mm (1.0 mm)

sect. *Dutra* (Bernh.) emend. D. R. A. Watson *sensu stricto*, with *D. metel*, *D. inoxia*, *D. velutinosa*, *D. wrightii*, and *D. lanosa*, and a new section established for *Datura*.

***Datura* L. sect. *Discola* D. R. A. Watson, sect. nov.**—TYPE: *Datura discolor* Bernh.

Plantae annuae, calycibus in sectione transversali 5-angulatis, fructibus pendulis dehiscentibus in 4 partibus.

Morphology determines that section *Discola* includes *D. discolor*, *D. reburra*, and *D. arenicola*, based on prismatic calyces, pendant capsules dehiscing regularly by four valves, and black to brown seeds. The analogous etymology is Latin for “of another habitat,” distinguishing the coastal shelf distribution of *Datura* annuals with prismatic calyces and pendant seed capsules.

KEY TO *DATURA ARENICOLA* AND COMPARABLE SPECIES WITH PRISMATIC CALYCES

1. Fruit erect: Section *Datura* L. (following Hammer et al. 1983) *D. quercifolia*
- 1' Fruit pendant: Section *Discola* D. R. A. Watson (following Mace et al. 1999; Jiao et al. 2002)
2. Corolla 6–18 cm; capsule ovoid; seeds rugulose; leaves glabrate to puberulent, entire to angular-sinuate, or bearing acutely dentate lobules *D. discolor*
- 2' Corolla 2.3–4.5 cm; capsule globose; seeds smooth; leaves pubescent to shortly vil-

lous, bearing obtusely dentate lobules . . .

. *D. arenicola*

It seems plausible that the four sections in the genus *Datura* correlate to geological epochs, orogenic influences, and climatic changes. At one time considered a section of the genus *Datura* (Bernhardi 1833), the tree daturas of the genus *Brugmansia* Pers. diverged during the Andean uplift in the late Tertiary (Lockwood 1973). This implies an earlier ancestral lineage that in all probability has evolved into the widest-ranging section *Datura*. Apparently the widespread *D. discolor* of section *Discola* populated the Sonoran Desert following increasing aridity in the late Tertiary (Axelrod 1950). As indicated by Dr. Robert Bye (UNAM, personal communication), the spineless *D. ceratocaula* emerged with central Mexico's Neovolcanic orogeny, which closed off the Balsas depression, inundating the Central Mesa during the Pliocene-Pleistocene. Thus species in section *Dutra* most likely evolved tubular calyces and irregularly dehiscent fruits during the Pleistocene pluvial period; when the epicarp ceased to dry and shrink, the spines no longer functioned to open the capsule valves. Considering the Neovolcanic influence and climate change over the biogeographic provinces, it is proposed that section *Ceratocaulis* be revised to include the Balsas basin species *D. kymatocarpa* and *D. leichhardtii*. This sectional emendation for *Datura* defines the

TABLE 2. GENUS *DATURA* SECTION REVISIONS.Section *Datura*

Wide-ranging annuals with prismatic calyx; erect capsule with spiny or smooth pericarp dehiscent regularly by four valves; seed black.

Included species: *D. stramonium*, *D. ferox*, *D. quercifolia*

Section *Discola* [Sect. nov.]

Coastal annuals with prismatic calyx; pendant capsule with spiny pericarp dehiscent regularly by four valves; seed black or brown.

Included species: *D. discolor*, *D. reburra*, *D. arenicola*

Section *Ceratocaulis* [Sect. rev.]

Inland annuals with tubular calyx, spathe-like or 5-acumina; pendant capsule with spiny, semi-capillaceous or smooth pericarp dehiscent irregularly; seed charcoal-brown, brown, red-brown or buff-yellow.

Included species: *D. ceratocaula*, *D. leichhardtii*, *D. kymatocarpa*

Section *Dutra* [Sect. emend.]

Tuberous rooted perennials with tubular calyx; pendant capsule with spiny, tuberculate or smooth pericarp dehiscent irregularly; seed brown, reddish-brown, reddish-yellow or buff-yellow.

Included species: *D. wrightii*, *D. inoxia*, *D. metel*, *D. lanosa*, *D. velutinosa*

evolution of all inland annual species with tubular calyces and irregularly dehiscent fruits (Table 2).

CONCLUSION

The new species was appropriately named the "sand dweller" by H. S. Gentry, who discovered it in the late 1940's during extensive botanizing in western Mexico. Very few botanical surveys have been carried out in the northern part of Baja California Sur, an area in which Dr. Jon Rebman predicts that many new species will be found. The Sierra San Francisco and Sierra Guadalupe may have provided the only corridor for plant dispersal in the late Pliocene, when sea levels were higher and the lower deserts were under water (Rebman 1997). The extensive distribution of *D. discolor* corresponds with the uplifting of the Lower Peninsula, where the small number of *D. wrightii* implicates anthropogenic origin. West of the Sierra San Francisco, the endemic *D. arenicola* inhabits the lower San Pablo watershed, which flows toward Laguna San Ignacio. In danger of extinction by human development, this species may be a candidate for the IUCN Red List of Threatened Species. For that reason it is not precisely located, although it is legally protected in La Reserva de la Biósfera El Vizcaíno. Additional field work is needed to establish the extent of distribution, as only 12 occurrences of *D. arenicola* are known to date.

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APPENDIX 1

SPECIMENS EXAMINED

Datura arenicola; MEXICO, BAJA CALIFORNIA SUR: Topotype: El Vizcaíno Junction, alt. ±90 m. 001 *D. R. A. Watson*, 27 Nov 1983 [F]; El Vizcaíno Junction, alt. 90 m, 045 *R. A. Bye* & *D. R. A. Watson*, 23 Jan 2010 [MEXU]; El Vizcaíno Junction, 046 *R. A. Bye* & *D. R. A. Watson*, 23 Jan 2010 [BCMEX]; El Vizcaíno Junction, 052 *R. A. Bye* & *E. Linares*, 24 Jan 2010 [MEXU]; El Vizcaíno Junction, 050 *D. R. A. Watson*, 25 Jan 2010 [MEXU]; El Vizcaíno Junction, 051 *D. R. A. Watson*, 25 Jan 2010 [MEXU]; San Pablo arroyo, 053 *D. R. A. Watson*, 25 Jan 2010 [MEXU]; San Pablo arroyo, 054 *D. R. A. Watson*, 25 Jan 2010 [MEXU].

- Datura discolor*; MEXICO, SONORA: Freshwater, Tiburon Island, 1010 *Y. E. Dawson*, Jan 1925 [RSA]; Tiburon Island, 28°57'N, 112°27'W, 12322 *R. Felger*, 2 Jan 1965 [MEXU]. BAJA CALIFORNIA (norte) & ISLAS FEDERAL: Bahía de Los Angeles, 251a *J. Rempel* May 1920 [USC]; South Bahía de Los Angeles, 28°53'N, 113°31'W, 32,698 *F. R. Thorne & J. Henrickson*, 26 Feb 1963 [RSA]; North Isla Partida, 28°52'N, 113°2'W, 3226 *I. M. Johnston*, 22 Apr 1921 [CAS, DS, GH]; Near Bahía Santa Teresa, alt. 50 m ca. 28°24'N, 112°53'W, 5732 *P. Tenorio & C. R. Tenorio*, 7 Apr 1987 [BCMEX]; 2 mi S of lighthouse, E Cedros Island, 28°22'N, 115°13'W, 5509 *C. Davidson*, 23, Feb 1977 [RSA]; Santa Gertrudis Mission, 28°03.577'N, 113°06.277'W, 037 *D. R. A. Watson & J. Johnson*, 19 Jan 2010 [MEXU]; In vado W of Santa Gertrudis Mission, 28°02.146'N, 113°11.245'W, 038, 039 *D. R. A. Watson & J. Johnson*, 20 Jan 2010 [MEXU]. BAJA CALIFORNIA SUR & ISLAS FEDERAL: El Vizcaíno Junction, 002a, b *D. R. A. Watson*, 27 Nov 1983 [F]; El Vizcaíno Junction, alt. 90 m, 047 *R. Bye & D. R. A. Watson*, 23 Jan 2010 [MEXU]; Road to Sierra de San Francisco, 27°26.857'N, 113°14.857'W, alt. 100 m, 049 *D. R. A. Watson*, 24 Jan 2010 [MEXU]; Mezquitilito Rancho, Sierra de San Francisco, 28°22'N, 115°13'W, 048 *D. R. A. Watson*, 24 Jan 2010 [MEXU]; Sierra San Francisco & Sierra Guadalupe, San Gregorio Cañón, 27°40'N, 112°59'W, 9303, 11,111 *J. Rebman*, 18 Oct 1997 [BCMEX, SD, HCIB]; Desviación a los Picachos, Desierto Vizcaíno, km 45 to Punta Abreojos, B. C. S. 26°59'N, 113°22'W, 2416 *J. L. León de la Luz*, 29 May 1990 [HCIB]; Arroyo San Pedro near La Bocana B. C. S., 12,513 *R. Moran* 1966 [RSA]; San Ignacio, 003a-d *D. R. A. Watson*, Nov 26 1983 [F]; San Ignacio, SW of the plaza, 044 *D. R. A. Watson*, 23 Jan 2010 [MEXU]; Tata Viejo vado, S of San Ignacio, 042, 043 *D. R. A. Watson & M. Somers*, 22 Jan 2010 [MEXU]; 5.6 mi N of Santa Rosalia, 11,057 *J. M. Porter*, 1995 [RSA]; Arroyo San Bruno, SE of Santa Rosalia, 4.8 mi off Mexico 1 toward San Jose de Magdalena, 5852 *R. F. Thorne & S. Boyd*, 1991 [RSA]; NW Isla San Marcos, 27°14'N, 112°06'W, 11,835 *J. L. León de la Luz*, 12 Oct 1996 [HCIB]; Between Santa Rosalia and Mulegé, boca de Magdalena Arroyo, ca. 27°04'18"N, 112°06'45"W, 13,101 *J. M. Porter & L. E. Machen*, 28 Dec. 2003 [BCMEX]; Below the bridge at Mulegé, corollas violet & white; 040, 041 *D. R. A. Watson*, 22 Jan 2010 [MEXU]; SW Bahía Concepcion peninsula, 7515 *A. C. Sanders* [RSA]; Isla Carmen, Puerto Balandra, 26.083°N, 111.318°W, 3737 *A. Carter*, 11 Mar 1960 [UC]; Arroyo de Sierra la Giganta, 24°41'N, 111°11'W, 7865 *J. L. León de la Luz*, 12 Oct 1996 [HCIB]; At foot of eastern hill, Cabo San Lazaro, Isla Magdalena, 2017 *C. Davidson*, Apr 1973 [RSA]; Cañada del faro, S Isla Santa Cruz, 25°17'N, 110°44'W, 8533 & 8536 *J. L. León de la Luz*, 11 Mar 1997 [HCIB]; NE Isla San Jose, 430 *G. Flores*, 1987 [RSA]; Rancho Monte Alto, N of Mesa San Alejo, Sierra la Giganta, 25°55'N, 111°37'W, 17,503 *J. J. Perez Navarro*, 13 Dec 2000 [HCIB]; El Embudo, Isla Partida, 24°26'N, 110°22'W, 12,982 *J. L. León de la Luz*, 16 Oct 1998 [HCIB]; Bahía San Gabriel, SE Isla Espíritu Santo, 24°25'N, 110°21'W, 7639 *M. D. Leon*, 26 Sep 1996 [HCIB]; El Comitán, 17 km NE La Paz, 24°13'N, 110°20'W, 5278 *J. L. León de la Luz*, 1 Nov 1986 [HCIB]; La Paz, to San Juan de la Costa, 24°07'N, 110°24'W, 7549 *J. L. Leon de la Luz*, 6 Nov 1996 [HCIB]; La Paz, 24°4'N, 110°24'W, 24,399 *M. E. Jones*, 9 Feb 1928 [POM]; On the beach at the marina, La Paz, 004 *D. R. A. Watson*, 10 Nov 1983 [F]; Arroyo Paredones Blancos, Isla Ceralvo, 24°15'N, 109°52'W, 6860 *M. D. Leon*, 26 Nov 1994 [HCIB]; Boca del Alamo, enter los Barriles y los Planes, 23°55'N, 109°50'W, 3594 *J. L. León de la Luz*, 15 Jan 1991 [HCIB]; Sierra la Laguna, Agua del El Palmillar, 33°31'N, 110°01'W, 5352 *J. L. León de la Luz*, 12 Nov 1986 [HCIB]; Sierra la Laguna, Cañón de la Zorra, W of Santiago, 23°30'N, 109°52'W, 2417 & 5340 *J. L. León de la Luz*, 1 Nov 1986 [HCIB]; Miraflores, 005 *D. R. A. Watson*, 10 Nov 1983 [F]; San Jose del Cabo, 23°3'N, 109°42'W, 24,396 *M. E. Jones*, 18 Jun 1928 [POM]; Cabo San Lucas, 006-8 *D. R. A. Watson*, 11 Nov 1983 [F].